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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/575,709	07/20/2000	Daniel P. Weitekamp	06618/488001/CIT/3024	5306
20985	7590	01/22/2004	EXAMINER	
FISH & RICHARDSON, PC 12390 EL CAMINO REAL SAN DIEGO, CA 92130-2081			LYONS, MICHAEL A	
			ART UNIT	PAPER NUMBER

2877

DATE MAILED: 01/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/575,709

Applicant(s)

WEITEKAMP ET AL.

Examiner

Michael A. Lyons

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 5-21 and 63-70 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 63-70 is/are allowed.
- 6) ☒ Claim(s) 5-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 July 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5-12 and 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murphy et al (5,381,229) in view of Payne et al (5,253,312).

Regarding claim 5, Murphy (Figs. 1 and 3) discloses a device comprising a laser 11, a single mode optical fiber 13 having a sensor tip region 14 having a second end facet that is partially reflective (light beam R1), a reflecting surface 25 as a measurand surface that forms an interferometer within the fiber and the sensor due to interference between light R1 in the sensor and light R2 reflecting off of the measurand, and a photodetector 18 coupled via coupler 16 to detect the interference generated by the device. Murphy, however, fails to disclose the exact angle of the tapered fiber or a perpendicular light path out of the fiber after reflection.

Payne (Fig. 1A) discloses a fiber tip for use in a laser delivery system at the end of an optical fiber where the tip of the fiber is angled at 45 degrees (A1), causing the light to exit the fiber perpendicularly (A2) towards whatever surface or measuring area is external to the fiber. It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the tip of Payne to the device of Murphy in order to clarify the actual function and specifications of the second fiber end. Angling the tip of Murphy, while keeping the partially reflective coating on the end, would make the device more compact without losing any of the

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functionality of the original device, as the measurand surface would be directly below the fiber sensor and perpendicular to the light exiting the fiber as claimed.

As for claim 6, the use of a not-flat fiber end is a matter of design choice, as the light would reflect off of a non-flat end similarly to a flat end.

As for claim 7, having multiple planes for light reflection is a matter of design choice, as it would create multiple areas of reflection on the measurand surface for more measurements.

As for claim 8, the end of the tip of Payne is polished and elliptical.

As for claim 9, the end of the tip of Murphy is coated with a partially light-reflecting material in order to reflect the light out of the fiber while keeping a portion of the light within the fiber for interference.

As for claims 10 and 11, Murphy's fiber is optically coupled to the laser and the photodetector by coupler 16.

As for claim 12, the spacing of the fiber and the measuring surface to create a maximum signal is a matter of design choice, as a maximum signal would merely generate a stronger result.

As for claims 18-21, Official Notice is taken as to the modifications listed in the claims as being all well known modifications and uses of optical fiber sensors in interferometry.

Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murphy et al (5,381,229) in view of Payne et al (5,253,312) and in further view of Hong et al (5,982,009).

As for claims 13-15, the combination of Murphy and Payne are disclosed above. However, this combination fails to disclose their use on a substrate with a mechanical oscillator such as a cantilever allowing movement of the fiber on the substrate. Hong discloses a device

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with a substrate 30 and a cantilever as a mechanical oscillator on the substrate that can be used with an optical fiber (Col. 8, lines 49-53). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the fiber of Murphy and Payne onto a substrate with a cantilever as per Hong to facilitate movement of the fiber with regard to the measurand.

Claims 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murphy et al (5,381,229) in view of Payne et al (5,253,312) and in further view of Doriath et al (4,516,073).

As for claim 16, the combination of Murphy and Payne are disclosed above. However, this combination fails to disclose their use within a magnetic system. Doriath discloses a device where an optical fiber is contained in a system containing static magnets 111 and 112 with the fiber between the gap in the magnets. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to place the fiber of Murphy and Payne in the magnetic field device of Doriath in order to locate the fiber and measurand in a static magnetic field for any desired measurements.

As for claim 17, the use of a moveable magnet in a system attached to a measuring surface is a matter of design choice.

Allowable Subject Matter

Claims 63-70 are allowed in view of the prior art.

The following is a statement of reasons for the indication of allowable subject matter:

As to claim 63, the prior art of record, taken alone or in combination, fails to disclose or render obvious an evanescent sensing device, in combination with the rest of the limitations of claim 63.

The prior art of record, such as the article "Demonstration of an optimized evanescent field optical fibre sensor" by Z.M. Hale et al., discloses the fact that tapering an optical fiber to expose its evanescent field for use in sensing various specimens is well known in the art. The prior art, however, fails to show this evanescent field sensing used in the manner claimed, wherein the tapered fiber is used in sensing a measurand surface, the signal generated by which is then combined 180 degrees out of phase with light carried through the system by a reference fiber. This combined signal is then detected at a photodetector to determine the distance between the tapered fiber section and the measurand. The evanescent field sensing in the prior art is mainly used for absorption sensing using dye cells rather than a physical distance measurement as claimed.

Response to Arguments

Applicants' arguments, see amendment filed November 4, 2003 with respect to the rejection(s) of claim(s) 5-21, have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of new art found as disclosed above.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Interferometric sensors utilizing bulk sensing mediums extrinsic to the input/output optical fiber, US Pat. 6,671,055 to Wavering et al.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael A. Lyons whose telephone number is 571-272-2420.

The examiner can normally be reached on Monday thru Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G Font can be reached on 571-272-2415. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0935.

MAL
January 8, 2004



Frank G. Font
Supervisory Patent Examiner
Technology Center 2800